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(57) Abstract

The invention relates to an additive with an emulsifying and/or gelling and/or foaming activity, to be obtained by dissolving gluten in a medium with a pH of a maximum of 4 in the presence of a reducing agent. The additive has different food and non–food applications such as in meat products, confectionery, cosmetic or personal care products and paints.

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# ADDITIVE WITH EMULSIFYING AND/OR GELLING AND/OR FOAMING ACTIVITY

The present invention relates to a new additive with emulsifying and/or foaming and/or gelling activity.

Many products for both food and non-food applications are compositions of different constituents. These constituents are not always mixable. In such a case an emulsifier must be added. Known emulsifiers for food applications are for instance casein, egg yolk and soya protein. Emulsifiers are also used in non-food applications, such as in the cosmetics and paint industry where mainly soaps and ethoxylated emulsifiers are employed.

It is often the wish for an emulsifier to also possess other functional properties. Casein is thus added not only for fat and water binding, but also after sterilization to give the product sufficient consistency by gelling. It is however necessary for this purpose for a heating to at least 120°C to take place, which is not always desirable. Another known emulsifier is egg yolk. A drawback hereof is that it loses its emulsifying activity due to pasteurization.

It is the object of the present invention to provide a new additive with an emulsifying and/or foaming and/or gelling activity. Owing to the gelling activity the additive can also be used for other applications such as confectionery. Gelatine for instance has been used heretofore for this purpose, and this is relatively expensive. An additional advantage of replacing gelatine by the new additive is, that products prepared herewith are also suitable for kosher and halal applications.

It has now been found according to the invention that gluten treated in a determined manner has such desired properties. Gluten is as such insoluble, very viscous and difficult to handle. Gluten is therefore already modified in different ways. A chemical modification used in practice is de-amidation of the gluten, wherein the gluten is modified such that by shifting the

isoelectric point the gluten become water-soluble in neutral environment. This method alters the chemical composition of the gluten. Also by means of (enzymatic) hydrolysis, optionally followed by fractioning, a gluten derivative can be obtained with emulsifying and/or foaming and/or gelling properties. Hydrolysis reduces the chain length of the polymer, which influences the emulsifying and/or foaming properties.

The treatment according to the invention comprises of dissolving gluten in a medium with a pH of a maximum of 4 in the presence of a reducing agent. The insolubility is hereby at least partially obviated by breaking bonds between the protein molecules. An increased temperature and/or high shear forces are preferably further applied.

It has been found that a pH of less than 4, preferably less than 3, is very suitable. The pH can be adjusted with any suitable acid. These can be inorganic acids such as hydrochloric acid, sulphuric acid or phosphoric acid, but for food applications these will be the acids much used in foodstuffs such as lactic acid, acetic acid, citric acid and tartaric acid or combinations thereof. It is recommended to choose, subject to the taste of the foodstuffs, an acid or combination of acids appropriate thereto.

The choice of the reducing agent will also depend on the application. A suitable reducing agent for food applications is for instance cysteine, glutathione, sulphite or a salt thereof. The food-grade reducing agent ascorbic acid is preferably used. In principle it is also possible to adjust the pH with ascorbic acid, but this is not recommended since ascorbic acid is relatively expensive.

It is recommended to dissolve the gluten at an increased temperature and high shear forces in a mixture of water with acid to the desired pH and the reducing agent. In this application "solution" is not always

understood to mean a strictly chemical solution but usually a turbid fluid, also referred to as dispersion.

The treatment with heat and high shear forces is preferably applied for about half an hour. At a shorter treatment time residual-gelling often takes place, while with too long a treatment time the dispersion is not stable and gelling can also occur. Increased temperature is understood to mean a temperature of at least 30°C and a maximum of 100°C. Such shear forces can for instance be achieved in an ultra turrax, homogenizing apparatus, colloid mill, Supraton or by means of a dispersing disc or intensive kneading.

It has been found that the additive according to the invention is, among other things, a very powerful emulsifier which is moreover resistant to pasteurization.

The additive according to the invention can also replace the usually used egg yolk as food additive in salad cream and mayonnaise. As stated, the drawback of egg yolk is that it cannot be pasteurized. Alternative proteins are found not to work as emulsifiers. The additive according to the present invention is however suitable for pasteurization.

An important application of the additive according to the invention as food additive is as emulsifier in so-called fatbody. Such fatbody consist for instance of coconut oil which can be emulsified in water by adding the additive according to the invention and are subsequently spray-dried to a free-flowing powder.

In the case of fatbody 1-3%, preferably 2%, of casein is currently used, while this can be 1-2%, preferably 1.5%, in the case of the additive according to the invention.

The additive according to the present invention can further be used as food additive to replace casein or soya protein in cold and pasteurized meat products. In such meat products the emulsifying activity is necessary to bind the fat in the product. In such meat products a gelling activity is also required in addition to an

emulsifying activity. The drawback of the now frequently used casein is for instance that it only gels when sterilized. However, it is sometimes not desirable to sterilize such meat products, because the taste and colour thereof can be diminished.

The additive according to the invention can be applied in pasteurized meat products to bind fat in the product and, in contrast to casein, does not first have to be sterilized to obtain a gelled mass. In some cases the binding of water can however deteriorate, but this can be counteracted by adding for instance a thickener.

Surprisingly, the additive according to the invention further has a foaming activity as food additive. Addition of the product to a mixture of a large amount of sugar and little water results for instance in the forming of a foam (so-called meringue) which can be used in confectionery.

The additive according to the invention can also be used in non-food applications where emulsions occur. Examples hereof are cosmetics or personal care products, such as creams, milks, gels, ointments and so on, and paint.

The additive according to the invention preferably contains 15-20% gluten on the basis of dry substance. Above this quantity there is the risk of the solution becoming too viscous because gelling occurs.

It is however possible to increase the dry substance content of the additive by preparing the additive as described above with 15-20% gluten on the basis of dry substance and adding thereto extra unmodified gluten up to for instance 30% dry substance. As such this would eventually result in a high-viscous product which would be difficult to process but, with direct processing thereof or addition thereof to the foodstuff under high shear forces, it is found surprisingly that it can in fact be processed. The reason why a higher dry substance content (i.e. protein content) might be desirable is that the end product thereby contains less water. The protein

content of the solution moreover determines the emulsifier content. If therefore more inexpensive gluten is present, the product becomes relatively cheaper because less is required.

The quantity of ascorbic acid used as reducing agent preferably amounts to between 1 and 1.5% of the total.

Products prepared with the additive according to the present invention will in general also contain other additives, which could have a negative effect on the activity of the additive. If for instance salt is added, it is recommended to add the salt after the additive which is found to be salt-sensitive. However, when an additional processing, for instance a homogenization, takes place, the adding sequence is not found to be crucial.

The present invention will be further elucidated on the basis of the accompanying examples, in which the preparation of the product in addition to a number of its applications are described.

**EXAMPLES**

Example 1

Preparation of an emulsifier according to the invention

Seven emulsifiers were prepared on the basis of gluten and ascorbic acid. The pH of the emulsifiers was adjusted with different acids. All preparations took place under high shear force but in different ways, such as for instance by means of a dispersing disc, an ultra turrax, a Supraton or intensive kneading. The samples were heated for 10-90 minutes at between 30°C and 100°C. Table 1 shows the different ingredients as well as the production temperature and production time.

It was found that heating of the sample preferably took place for 20-30 minutes at 60°C. If the sample contained 15% gluten a low-viscous dispersion was obtained, while at 20% gluten the mass was more viscous but still pumpable. Addition of ascorbic acid was found to result in a material which had a stable viscosity in

time. It is however also possible to prepare the emulsifier without ascorbic acid but the functional (emulsifying) properties are then less good and the viscosity of the emulsifier is not stable. In one of the samples dry gluten was mixed into the gluten emulsifier to increase the dry substance content and the content of protein.

Table 1
Influence of composition and method on viscosity of gluten emulsifier

| Sample number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Composition (g) | | | | | | | |
| Water | 41630 | 42772 | 20 | 9346 | 2243 | 2243 | 9770 |
| Gluten | 7752 | 13043 | 20 | 2717 | 623 | 623 | 1963 |
| Ascorbic acid | 684 | 900 | 1.8 | 187 | 45 | 45 | 150 |
| Citric acid | | | 3 | 250 | 30 | 30 | 150 |
| Acetic acid | 1520 | 1920 | | | | | |
| Lactic acid | | 1366 | | | | | |
| Sugar | | | 60 | | | | |
| Gluten | | | | | | 475[2] | |
| Gluten content (%) | 14 | 20 | 15 | 20 | 20 | 30 | 15 |
| Production temperature (°C) | 90 | 60 | 20 | 30 | 60 | 60 | 60 |
| Production time (min) | 45 | 30 | 10[1] | 60 | 30 | 30 | 88 |
| Viscosity (mPa*s) | 600 | 7500 | gel | 7000 | - | gel | - |

[1] kneading in minor-pin mixer

[2] dry gluten admixed after preparation of emulsifier under high shear

Example 2

Gluten emulsifier for use in salad cream

For the preparation of salad cream a carrier was first prepared by suspending a starch mixture of 220.5 grams of Puramyl SP (Avebe Latenstein B.V.) and 220.5 grams of C*tex 06304 from Cerestar in 3430 grams of water with 65 grams of kitchen salt, 44 grams of sugar, 245 grams of 8% acetic acid and 196 grams of 8% lactic acid.

This mixture was heated to 85°C and held at this temperature for 3 minutes. The mass was then cooled while being stirred.

For the preparation of salad cream an oil phase with 226 grams of soya oil, 0.4 grams of xanthane gum and 1.6 grams of guar gum were mixed under high shear forces (for instance in an ultra turrax, dispersing or homogenizing apparatus or a colloid mill) with 181 grams of the above described carrier, 3-39 grams of the gluten emulsifier 2 of example 1 and water, with 0.5 grams of potassium sorbate and 3.5 grams of kitchen salt.

When use was made of the ultra turrax it was found that good and stable emulsions were obtained from 0.13% gluten. This corresponds with the lower limit which applies when use is made of liquid egg yolk normally used as emulsifier.

The salad cream prepared with the gluten emulsifier according to the invention was found, in contrast to that prepared with liquid egg yolk, to be well heat-stable (15 minutes at 120°C) and freeze-thaw stable.

Example 3

Gluten emulsifier for use in fat/water emulsions stabilized by protein

Different fat/water emulsions stabilized by protein can be prepared with the gluten emulsifiers described in example 1.

590 grams of the gluten emulsifier 1 of example 1 was thus emulsified in a homogenizer with 5000 grams of fluid coconut oil and 1800 grams of glucose syrup (65% dry substance) and 1540 grams of water. After spray-drying of this emulsion a stable fatbody was obtained with 80% fat.

With the gluten emulsifier 7 a fat/water emulsion stabilized by protein was made for calf milk. For this purpose 2640 grams of gluten emulsifier was suspended in 2165 grams of water. Added hereto was 2160 hydrolized wheat protein (Wheaprolat) (Avebe Latenstein B.V.) or a

mixture of 1760 grams of glucose and 400 grams of Wheaprolat. This suspension was optionally adjusted to pH 6.25. After heating to 60°C, 1037 grams of a fat mixture for calf milk (Sloten Jongveevoeders) and 7 grams of glyceryl monostearate (GMS) was added and homogenized with an ultra turrax. The stability of these homogenisates was examined after 48 hours. At that moment in time no creaming of fat separation or water separation had taken place. The stability was independent of the pH of the obtained emulsion.

It was also possible to obtain stable emulsions when 40% fat, 0.1% glyceryl monostearate (GMS) and 5% (on the basis of dry substance) of the gluten-stabilized emulsions 2 or 7 of example 1 were used.

Example 4

Gluten emulsifier for use in meat products

The gluten emulsifier according to the present invention is suitable for the preparation of cold or pasteurized meat products. In order to demonstrate this a model emulsion for meat products was prepared by chopping 1500 grams of fatty bacon slowly for 1 minute and rapidly for 2 minutes in a so-called Scharfen meat cutter (content 5 kg). 1250 g respectively 625 g of gluten emulsifier 5 of example 1 was then added and 300 g respectively 925 g of water. Both were brought in advance to 60°C and were subsequently chopped slowly for 3 minutes and then rapidly for 2 minutes. Thereafter 60 grams of kitchen salt was added during 2 minutes of rapid chopping. The obtained emulsion was partly canned in cans of 400 ml, which were pasteurized for 2 hours at 70°C. Another part was transferred to a plastic beaker and stored at room temperature so as to be able to determine the effect of pasteurization.

In similar manner a mixture of 834 g of gluten emulsifier 6 of example 1 with 716 g of water and, for comparison purposes, a mixture of 270 g sodium caseinate with 1530 g of water were used.

The samples with the gluten emulsifiers according to the invention were found to fully bind the bacon fat both after pasteurization and at room temperature. These emulsions had reasonable to good cohesion and formed a soft gel. In all cases there was however a little cooking loss (5-10%). If on the other hand casein was used as emulsifier, no cohesion was obtained and after pasteurization there was a very high level of cooking loss (>30%) and, in addition, not all the bacon fat was bound.

Example 5

Gluten emulsifier as foaming agent

Surprisingly, it was found that the gluten emulsifier according to the present invention also has good properties as foaming agent. By adding 420 g of sugar and 168 g of water to gluten emulsifier 3 of example 1 and whipping this mass in a mixer with whisk a foamy mass was obtained. This foam can serve as basis for the preparation of light confectionery.

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## CLAIMS

1. Additive with an emulsifying and/or gelling and/or foaming activity, to be obtained by dissolving gluten in a medium with a pH of a maximum of 4 in the presence of a reducing agent.

2. Additive as claimed in claim 1, **characterized in that** the medium is water, the pH of which is adjusted with an acid, for instance chosen from hydrochloric acid, sulphuric acid or phosphoric acid or combinations thereof for non-food applications and from lactic acid, acetic acid, citric acid, tartaric acid and hydrochloric acid or combinations thereof for food-applications.

3. Additive as claimed in claim 1 or 2, **characterized in that** the reducing agent is chosen from one or more of the following: ascorbic acid, sulphite, cysteine and glutathione, or salts thereof.

4. Additive as claimed in any of the foregoing claims, comprising 15-20% gluten, 0.5-3%, preferably 1-1.5% ascorbic acid and an acid to a pH of a maximum of 4, preferably a maximum of 3.

5. Additive as claimed in any of the claims 1-4, to be obtained by subjecting a mixture of gluten, reducing agent and acid in water to a high shear force for about 30 minutes at a temperature between 20 and 100°C.

6. Additive as claimed in any of the claims 1-5 for use as emulsifier.

7. Additive as claimed in any of the claims 1-5 for use as foaming agent.

8. Emulsion, comprising a water phase, a fat or oil phase and an additive as claimed in any of the claims 1-6.

9. Emulsion as claimed in claim 8, which emulsion is mayonnaise, salad cream, salad dressing, marinade.

10. Fat/water emulsions stabilized by protein, to be obtained by emulsifying a fat in the presence of an additive as claimed in any of the claims 1-6.

11. Fat/water emulsions stabilized by protein as claimed in claim 10, wherein the fat is coconut oil.

12. Meat product comprising in addition to the usual ingredients a food additive as claimed in any of the claims 1-6.

13. Confectionery comprising in addition to the usual ingredients a food additive as claimed in any of the claims 1-7.

14. Cosmetic or personal care product comprising in addition to the usual ingredients an additive as claimed in any of the claims 1-7.

15. Paint comprising in addition to the usual ingredients an additive as claimed in any of the claims 1-6.

16. Additive as claimed in claims 1-7 for use in a food emulsion, meat product, confectionery, cosmetic or personal care product or paint.

# INTERNATIONAL SEARCH REPORT

Inter onal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
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According to International Patent Classification (IPC) or to both national classification and IPC

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Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B01F

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[X] Further documents are listed in the continuation of box C.

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